## Testing requirements for covid-19

Testing volume requirements will differ depending on key factors such as purpose, overall policy objectives, incidence levels, the properties of specific tests, and the existence and effectiveness of other measures, including behavioural considerations. Below is an overview of estimates of testing requirements that SAGE has reviewed, including dependency on other factors such as overall incidence of infection where relevant. These are not comprehensive and there are other testing requirements that should be considered or are operationally determined, for example testing in other settings such as prisons, or as part of clinical trial protocols.

### Patients and key workers

Testing demand will depend upon the prevalence of infection, which will greatly affect overall numbers. The information here is provided by DHSC testing cell. Numbers are based on the current infection rate and do not account for a reduction over time – so are only intended to be a guide to matching capacity and demand in the short-term.

Currently projected demand includes the following groups:

1. Patients and NHS key workers (symptomatic except for any residents being admitted to care homes, on discharge or otherwise).
2. Symptomatic NHS and social care workers, or members of their household.
3. Symptomatic wider key workers or members of their household are now being tested. The expansion across key worker groups will be done in phases (Table 1):
    a. Currently we are testing Priority 1 & 2 key workers as defined by the HMIG list: this encompasses NHS and social care workers, emergency services, critical infrastructure workers, and prisons workers amongst others. This workforce population is estimated at 5.7 million.
    b. On Thursday, 23rd April we will expand to encompass the entire HMIG list of key workers – this captures priority 3 key workers such as food, transport, education, and telecoms amongst others. This also currently includes modelling for all teachers. The entire set of key workers is estimated as a population of 10.8 million workers

*Table 1: currently projected demand for specific groups*

| Testing Phase | Testing group | Estimated population size | Cumulative population | Estimated daily testing requirement |
|---|---|---|---|---|
| **Current scope of testing** | **Hospital Patients** (incl. emergency and elective admissions) | - | **-** | 12,000 |
| | **Care home residents** | - | **-** | 12,000* |
| | **Priority 1 Key Workers (NHS and Social Care workers)** | 2,687,000 | **-** | 10,211 |
| | **Priority 2 Key Workers** | 3,067,016 | **5,754,016** | 11,655 |
| **Expanded key worker scope** (planned 23 April) | **Priority 3 Key Workers** | 5,023,860 | **10,777,876** | 19,091 |

| | |
|---|---|
| **Total demand numbers** | **64,957** |

*Care Home residents are likely to be more widely tested going forward. This number is difficult to estimate currently and as such we have assumed a rate which is equivalent to hospital patients.

**Community surveillance**

Community surveillance is used to answer questions about the extent of transmission and infection in the UK (with PCR testing) or immunity/seroprevalence (using antibody testing). For example, a repeated survey testing a set of population-representative households can be used to estimate the full extent of transmission and infection in the UK. The precision of such an estimate depends on the size and nature of the sample, as well as the true incidence and prevalence in the whole population.

Based on a conservative assumption that all households should be counted as one unit (as members are likely to have the same infection status), ONS and Wellcome have concluded that a protocol where approximately **10-11,000 households are tested weekly** in each survey would provide sufficient overall precision for this purpose (see table 2), as well as enabling investigation of variation in smaller subgroups.

*Table 2: Expected margin of error (%) for different survey sizes and true incidence/prevalence rates*

| | 10000 household tests/week | 1000 household tests/week |
|---|---|---|
| 0.01% incidence/prevalence | 0.06% | 0.37% |
| 0.1% incidence/prevalence | 0.14% | 0.55% |
| 1% incidence/prevalence | 0.40% | 1.4% |
| 5% incidence/prevalence | 0.86% | 2.8% |
| 10% incidence/prevalence | 1.2% | 3.8% |

**Contact tracing and case identification**

The number of tests needed for contact tracing depends primarily on the incidence of symptomatic cases of Covid-19, the proportion of those cases who report their symptoms, the number of contacts traced per case, and the proportion of those contacts who are tested. The incidence of symptomatic cases in turn depends on the non-pharmaceutical interventions (NPIs) in place. Until testing data are available from community surveillance (see above), we will not know the incidence of infection or symptomatic cases with any degree of certainty.

A successful contact tracing strategy would require around 80% of non-household contacts of symptomatic cases to be traced and isolated rapidly, ideally within two days of symptom onset for the index case. This would require around 30 contacts to be traced per symptomatic case. Beyond that, benefits would be marginal. To rely on extremely high levels of contact tracing and app coverage to suppress the epidemic, could require the order of millions of people be isolated per day. Results have been provided by SPI-M below (tables 3-5) for three different incidence levels, 10, 20, or 30 contacts being traced per symptomatic case identified, and three different scenarios for the proportion of traced contacts who are then tested.

Initial analysis and sensitivity testing of possible scenarios for lifting and/or amending NPIs suggests that the full range of numbers of contacts to be traced and tested shown in the tables below are plausible i.e. depending on the NPIs in place, the requirement for tracing and testing could be fewer

than 100k tests per day (if incidence is kept very low and few contacts are traced and tested**)** or over 1m tests per day.

*Table 3: Number of people needing to be tested per day in different scenarios, if 90% of people with Covid-like symptoms report them and **all** their identified contacts are tested. Assumes contacts are independent*

| | 100,000 people with new Covid-like symptoms per day | 25,000 people with new Covid-like symptoms per day | 10,000 people with new Covid-like symptoms per day |
|---|---|---|---|
| 10 contacts traced per case | 990,000 | 247,500 | 99,000 |
| 20 contacts traced per case | 1,890,000 | 475,500 | 189,000 |
| 30 contacts traced per case | 2,790,000 | 697,500 | 279,000 |

*Table 4: Number of people needing to be tested per day in different scenarios, if 90% of people with Covid-like symptoms report them and **half** of identified contacts are tested. Assumes contacts are independent*

| | 100,000 people with new Covid-like symptoms per day | 25,000 people with new Covid-like symptoms per day | 10,000 people with new Covid-like symptoms per day |
|---|---|---|---|
| 10 contacts traced per case | 540,000 | 135,000 | 54,000 |
| 20 contacts traced per case | 990,000 | 247,500 | 99,000 |
| 30 contacts traced per case | 1,440,000 | 362,000 | 14,000 |

*Table 5: Number of people needing to be tested per day in different scenarios, if 90% of people with Covid-like symptoms report them and **only index cases** (those first reporting, not further contacts) are tested. Assumes contacts are independent*

| | 100,000 people with new Covid-like symptoms per day | 25,000 people with new Covid-like symptoms per day | 10,000 people with new Covid-like symptoms per day |
|---|---|---|---|
| 10 contacts traced per case | 90,000 | 22,500 | 9,000 |
| 20 contacts traced per case | 90,000 | 22,500 | 9,000 |
| 30 contacts traced per case | 90,000 | 22,500 | 9,000 |